### COURSE DETAILS

<table>
<thead>
<tr>
<th><strong>Course Code:</strong> B28PO</th>
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<tr>
<td><strong>Full Course Title:</strong> Photonics and Optics</td>
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<td><strong>SCQF Level:</strong> 8</td>
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<td><strong>SCAF Credits:</strong> 15</td>
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<tr>
<td><strong>Available as Elective:</strong> No</td>
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### DELIVERY LEVEL

| **Undergraduate:** Yes | **Postgraduate Taught:** No | **Postgraduate Research:** No |

### COURSE AIMS

- To give a grounding in the technology of photonics and its applications
- To provide an understanding of wave optics, including interference, coherence, diffraction
- To provide an understanding of the physics behind the major photonics elements including polarisation, birefringence, and optical fibres
- To provide an understanding of optics and simple optical systems.

### LEARNING OUTCOMES – SUBJECT MASTERY

- Understanding of light as a wave and the relevance of this to optical effects such as interference and diffraction, and hence to lasers and optical fibres
- Students should be able to use mathematical methods to predict optical effects with e.g. light-matter interaction, interference, fibre optics, geometrical optics

### LEARNING OUTCOMES – PERSONAL ABILITIES
• Students should develop abilities to:
  - critically evaluate a problem
  - plan and organise their work
  - review and evaluate academic materials
  - express and interpret physical data graphically
  - solve problems mathematically.

• Take an interest in current developments in, and applications of, physics; make critical and evaluative comment; understand that physics is a changing subject; think independently about the subject.

• Make effective use of online learning support materials; make effective use of the support of academic and tutorial support staff; organise their study time in a way that allows them to meet coursework submission deadlines and prepare effectively for assessments

SYLLABUS

Photonics

• Waves: wave equation; spherical, plane waves; superposition
• Interference: double & multiple beam interference; interferometers (Michelson, Mach-Zehnder, Fabry-Perot); coherence
• Diffraction: Fraunhofer diffraction; diffraction gratings and resolving power
• Lasers: principles of operation (stimulated emission, resonators, population inversion and how to achieve it); properties of laser light
• Fibre optics: principles of optical waveguides (including fibre optics)- total internal reflection, modes; applications of fibre optics
• Applications of photonics: a number of applications will be explored, such as: optical data storage; laser ranging; laser processing of materials (welding, drilling, cutting, etc; optical telecommunications.

Optics
B28PO Photonics and Optics

- Geometric optics:
  - Lenses and mirrors; thin lens equation; combinations of lenses; thick lenses and principal planes; aberrations.
  - Examples of imaging systems.

- Polarisation:
  - Polarisers, waveplates
  - Birefringence

### COURSE RELATIONSHIPS
N/A

### LOCATION AND ASSESSMENT METHODS

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